Amendments to the Specification

Please amend the paragraph beginning on page 12, line 21, as follows:

~~Fig. 1~~ Each of Fig. 1(a), Fig. 1(b), Fig. 1(c) and Fig. 1(d) is a plan view of a fuel cell according to the invention in a first embodiment~~, where the reaction gas and cooling water flowing in corresponding channels arranged in a plate are schematically represented in a perspective view~~. Fig, 1(a) is a plan view of a first plate mounted in a fuel cell stack, viewed from the side of the fuel gas channels and shows the side of a first surface of the first plate. Fig. 1(b) is a plan view of the first plate mounted in the fuel cell stack, viewed from the side of the water channels and shows the side of a second surface of the first plate. Fig. 1 (c) is a plan view of the other plate (a second plate) mounted in the fuel cell stack, viewed from the side of the air channels and shows the side of a third surface of the second plate. Fig. 1(d) is a plan view of the second plate mounted in the fuel cell stack, viewed from the side on which no gas channels are formed and shows the side of a fourth surface of the second plate. ~~In Fig. 1, reference~~ Reference numeral 1 shown in Fig. 1(a) and Fig. 1(b) and reference numeral 1' shown in Fig. 1(c) and Fig, 1(d) ~~means~~ mean the ~~plate~~ plates (i.e. the first and second plates) typically made of carbon, respectively. ~~where~~ In Fig. 1(a), a plurality of concave groove-shaped gas channels 2 is formed on one surface (the first surface) of the plate 1 so as to align in the up/down direction (the direction of gravity). [[and]] In Fig. 1(b), a plurality of concave groove-shaped water channels 7B ~~(7B is shown in Fig. 1(b))~~ is formed on the other surface (the second surface) of the plate 1 so as to align in the up/down direction (the direction of gravity) to be back to back each other. In this case, a gas supply manifold hold 3 is disposed on the upper left side of the plate 1 so as to pass therethrough, and the gas supply manifold hole 3 is connected to a gas inlet header 4 in the concave form. Moreover, the gas inlet header 4 is further connected to the gas channels 2. The

gas inlet header 4 is defined as an area where a reaction gas (fuel gas) supplied in a distributed state from the gas supply manifold hole 3 is further supplied to the inlet of the gas channels 2 (the same definition is applied in the following). Such a gas inlet header 4 is generally called as a manifold.

Please amend the paragraph beginning on page 13, line 24, as follows:

On the upper right side of the plate 1 (the side opposite to the gas supply manifold hole 3), a water supply manifold hole 7 is disposed so as to pass through the plate 1, and referring to Fig. 1(b) the water supply manifold hole 7 is connected to a water inlet header 7A ~~(7A is shown in Fig. 1(b))~~ in the concave form, which is disposed on the other surface (second surface) of the plate 1. In Fig. 1(b), ~~The~~ the water inlet header 7A ~~(7A is shown in Fig. 1(b))~~ is further connected to the inlet of the water channels 7B ~~(7B is shown in Fig. 1 (lb))~~. In this case, the gas inlet header 4 and the water inlet header 7A ~~(7A is shown in Fig. 1(b))~~ are disposed respectively on the one surface (the first surface) and the other surface (the second surface) of the plate 1 to be back to back each other.

Please amend the paragraph beginning on page 14, line 20, as follows:

On the other hand, in Fig. 1(c), a plurality of gas channels 2'~~(2'is shown in Fig. 1(c))~~ corresponding to the gas channels 2 in the plate 1 shown in Fig. 1(a) and Fig. 1(b) is disposed from top to bottom (in the direction of gravity) in the other plate (the second plate) 1'. A gas inlet header 4' in the concave form is connected to the inlet of the gas channels 2'~~(2'is shown in Fig. 1(c))~~ and a gas outlet header 5' in the concave form is connected to the outlet of the gas channels 2' ~~(2'is shown in Fig. 1(c))~~. As a result, in the other plate 1', an oxidant gas (In this case, air introduced from the outside air) is supplied to the gas inlet header 4', and distributed into the gas

channels 2' ~~(2'is shown in Fig. 1(c))~~ from the gas inlet header 4'. Then, the oxidant gas flows from top to bottom along the gas channels 2' ~~(2'is shown in Fig. 1(c))~~, and discharged to the gas outlet header 5', and finally discharged to the outside of the fuel cell stack.

Please amend the paragraph beginning on page 15, line 3, as follows:

A cell is inserted between the gas channels 2 of the plate 1 and the gas channels 2' ~~(2'is shown in Fig. 1(c))~~ of the other plate 1', and the composite member thus formed is mounted in the fuel cell stack. In this case, a unit cell is constituted by contacting closely and facing the anode of the cell to the gas channels 2 of the plate 1 and by contacting closely and facing the cathode of the cell to the gas channels 2' ~~(2'is shown in Fig. 1(c))~~ of the other plate 1'. Then, the fuel cell stack is constituted by stacking the unit cells to form a unit cell. Regarding the gas inlet headers 4, 4', the gas outlet header 5, 5', the water inlet header 7A ~~(7A is shown in Fig. 1(c))~~ and the water outlet header 7C (7C is shown in Fig. 1([[c]] b)), the upper surface of the concave portion is covered by a gasket or the like, thereby enabling the leakage of gas and water to be prevented.

Please amend the paragraph beginning on page 15, line 13, as follows:

In the fuel cell thus constituted, the fuel gas flows in the gas channels 2 of the plate 1 and the oxidant gas flows in the gas channels 2' ~~(2' is shown in Fig. 1(c))~~ of the other plate 1'. As a result, an electrochemical reaction takes place via the polymer electrolyte membrane of the cell, thereby enabling the DC electric power to be generated.

Please amend the paragraph beginning on page 15, line 17, as follows:

In order to humidify the polymer electrolytic membrane of the cell in the saturated state, the fuel gas is supplied to the fuel cell stack, after it is humidified with, for example, a humidifier at a dew point close to the cell temperature. In the prior art, a wet fuel gas is cooled particularly in the inlet area of the gas channels 2, when it is supplied to the gas channels 2, so that the water vapor contained in the gas is dew condensed to form the dew. As a result, the condensed water is adhered to inside wall of the gas channels 2 and clogs them, thereby causing the flow of the fuel gas to be interrupted. In this embodiment, however, the water inlet header 7A ~~(7A is shown in Fig. 1(c))~~ is disposed so as to be close to the gas inlet header 4 so as to be back to back each other. As a result, the water inlet header 7A is heated by the cooling water as a heat medium supplied thereto, and the gas inlet header 4 is indirectly heated up by the heat conduction, thereby making it possible to prevent the water vapor contained in the fuel gas from dew condensation.

Please amend the paragraph beginning on page 16, line 11, as follows:

In this embodiment, the cooling water is used as a heat medium for preventing the dew condensation in the fuel gas. However, the oxidant gas can be used for the heat medium instead of the cooling water. In this case, the gas inlet header 4' for the oxidant gas is disposed close to the gas inlet header 4 for the fuel gas in the plate 1 on the other surface, although the arrangement is not shown, and water channels 7B for supplying the cooling water are disposed in the other plate 1'. Furthermore, in order to prevent the dew condensation of the fuel gas by the oxidant gas (air), the temperature of the air inlet is set such that the dew point of the fuel gas $\leq$ the temperature of the air.

Please amend the paragraph beginning on page 16, line 22, as follows:

~~Fig. 2~~ Each of Fig. 2(a), Fig. 2(b), Fig. 2(c) and Fig. 2(d) is a plan view of a fuel cell according to the invention in a second embodiment~~, where the reaction gas and cooling water flowing in corresponding channels arranged in a plate are schematically represented in a perspective view~~. This embodiment is different from the first embodiment as for the point that an inner air manifold system is employed in the second embodiment. Fig. 2(a) is a plan view of a first plate mounted in a fuel cell stack, viewed from the side of the fuel gas channels and shows the side of a first surface of the first plate, Fig. 2(b) is a plan view of the first plate mounted in the fuel cell stack, viewed from the side of the water channels and shows the side of a second surface of the first plate. Fig. 2(c) is a plan view of the other plate (a second plate) mounted in the fuel cell stack, viewed from the side of the air channels and shows the side of a third surface of the second plate. Fig. 2(d) is a plan view of the second plate mounted in the fuel cell stack, viewed from the side on which no gas channels are formed and shows the side of a fourth surface of the second plate. ~~In Fig. 2, reference~~ Reference numeral 1 shown in Fig. 2(a) and Fig. 2(b) and reference numeral 1' shown in Fig. 2(c) and Fig. 2(d) ~~means a plate~~ mean plates (i.e. the first and second plates) typically made of mainly carbon, respectively. In Fig. 2(a), a [[. A]] plurality of gas channels 2 in the form of concave grooves are disposed from top to bottom (in the direction of gravity) on one surface (a first surface) of the plate 1, and a gas supply manifold hole 3 is disposed on the upper left side of the plate 1 in such a way that it passes through the plate 1, and the gas supply manifold hole 3 is connected to a gas inlet header 4 in the concave form. Moreover, the gas inlet header 4 is connected to the gas channels 2. Such a gas inlet header 4 is generally called as a manifold. [[and]] In Fig. 2(b), a plurality of water channels 7B ~~(7B is shown in Fig. 2(b))~~ in the form of concave grooves are disposed from top to bottom (in the

direction of gravity) on the other surface (the second surface) of the plate 1 in such a way that the gas channels 2 and the water channels 7B ~~(7B is shown in Fig. 2(b))~~ are back to back each other. ~~In this case, a gas supply manifold hole 3 is disposed on the upper left side of the plate 1 in such a way that it passes through the plate 1, and the gas supply manifold hole 3 is connected to a gas inlet header 4 in the concave form. Moreover, the gas inlet header 4 is connected to the gas channels 2. Such a gas inlet header 4 is generally called as a manifold.~~

Please amend the paragraph beginning on page 17, line 11, as follows:

[[The]] Referring to Fig. 2(a) the outlet of the gas channels 2 is connected to a gas outlet header 5 in the form of a concave shape, and the gas outlet header 5 is connected to a gas discharging manifold hole 6, which is disposed on the lower left side of the plate 1 so as pass therethrough. As a result, a reaction gas (fuel gas) supplied from the end portion of the fuel cell stack is distributed to the gas inlet header 4 of the plate 1 in each cell via the gas supply manifold hole 3 which is aligned in the stacking direction of the fuel cell stack, and the reaction gas is further distributed from the gas inlet header 4 into the gas channels 2, so that the gas thus distributed flows from top to bottom along the gas channels 2, and it is discharged to the gas outlet header 5 and further flows into the gas discharge manifold hole 6 aligned in the stacking direction of the fuel cell stack. Finally, the reaction gas is discharged from the end portion of the fuel cell stack to the outside via the gas discharge manifold hole 6.

Please amend the paragraph beginning on page 17, line 24, as follows:

In addition, a water supply manifold hole 7 is disposed on the upper right side of the plate 1 (on the side opposite to the gas supply manifold hole 3). [[The]] In Fig. 2(b), the water supply

manifold hole 7 is connected to the water inlet header 7A ~~(7A is shown in Fig. 2(b))~~ in the form of a concave shape, which is disposed on the other surface of the plate 1, and the water inlet header 7A ~~(7A is shown in Fig. 2(b))~~ is connected to the inlet of the water channels 7B ~~(7B is shown in Fig. 2(b)).~~

Please amend the paragraph beginning on page 18, line 2, as follows:

Moreover, a water outlet header 7C ~~(7C is shown in Fig. 2(b))~~ in the concave form is disposed in the outlet of the channels on the other surface of the plate 1, and the water outlet header 7C ~~(7C is shown in Fig. 2(b))~~ is connected to a water discharge manifold hole 8, which is disposed on the lower right side of the plate 1 (on the side opposite to the gas discharge manifold hole 6) so as pass therethrough. As a result, water (cooling water), which is supplied from the end portion of the fuel cell stack, is supplied and distributed to the water inlet header 7A ~~(7A is shown in Fig. 2(b))~~, in the plate 1 of each cell via the water supply manifold hole 7 aligned in the stacking direction of the fuel cell stack, and the water is further distributed from the water inlet header 7A to the water channels 7B ~~(7B is shown in Fig. 2(b))~~. Thereafter, the water flows from top to bottom along the water channels 7B ~~(7B is shown in Fig. 2(b))~~, and it is discharged to the water outlet header 7C ~~(7C is shown in Fig. 2(b))~~ and then flows into the water discharge manifold hole 8 aligned in the stacking direction of the fuel cell stack. Finally, the water is discharged to the outside from the end portion of the fuel cell stack via the water discharge manifold hole 8.

Please amend the paragraph beginning on page 18, line 16, as follows:

On the other hand, referring to Fig. 2(c), a plurality of gas channels 2'~~(2'is shown in Fig. 2(c))~~ corresponding to the gas channels 2 in the plate 1 shown in Fig. 2(a) and Fig. 2(b) are arranged from top to bottom (in the direction of gravity) in the other plate (the second plate) 1'. In this case, a gas supply manifold hole 3' is disposed on the upper right side of the other plate 1' so as to pass therethrough, and the gas supply manifold hole 3' is connected to a gas inlet header 4' ~~(4'is shown in Fig. 2(c))~~ in the concave form, and further the gas inlet header 4' ~~(4'is shown in Fig. 2(c))~~ is connected to the gas channels 2'~~(2'is shown in Fig. 2(c))~~.

Please amend the paragraph beginning on page 18, line 23, as follows:

[[The]] In Fig. 2(c), the outlet of the gas channels 2' ~~(2'is shown in Fig. 2(c))~~ in the other plate 1' is connected to the gas outlet header 5' ~~(5'is shown in Fig. 2(c))~~ in the concave form, which is disposed in the lower part of the other plate 1', and the gas outlet header 5'~~(5'is shown in Fig. 2(c))~~ is further connected to a gas discharge manifold hole 6', which is disposed in the lower end of the other plate 1' so as pass therethrough. As a result, oxidant gas (air) supplied from the end portions of the fuel cell stack is supplied and distributed to the gas inlet header 4'~~(4'is shown in Fig. 2(c))~~ on the other plate 1' in each cell via the gas supply manifold hole 3' aligned in the stacking direction of the fuel cell stack, and then distributed to the gas channels 2'~~(2'is shown in Fig. 2(c))~~ from the gas inlet header 4'~~(4'is shown in Fig. 2(c))~~. The oxidant gas thus distributed flows from top to bottom along the gas channels 2'~~(2'is shown in Fig. 2(c))~~, and it is discharged to the gas outlet header 5'~~(5'is shown in Fig. 2(c))~~. Thereafter, the oxidant gas flows into the gas discharge manifold hole 6' aligned in the stacking direction of the fuel cell stack and is discharged from the end portion of the fuel cell stack to the outside via the gas discharge manifold hole 6'.

Please amend the paragraph beginning on page 19, line 10, as follows:

Similarly to the first embodiment, each cell is inserted between the gas channels 2 in the plate 1 and the gas channels 2' ~~(2'is shown in Fig. 2(c))~~ in the other plate 1', and the composite elements obtained after the insertion are mounted in the fuel cell stack. In this case, an anode in the cell faces the gas channels 2 in the plate 1 and contacts closely thereto, and a cathode in the cell faces the gas channels 2' ~~(2'is shown in Fig. 2(c))~~ in the other plate 1' and contacts closely thereto, so that a unit cell is formed. The fuel cell stack is produced by stacking such unit cells to form a unit. In this case, the gas inlet header 4, gas outlet header 5, water inlet headers 7A ~~(7A is shown in Fig. 2(b))~~ and the water outlet header 7C ~~(7C is shown in Fig. 2(b))~~ are covered on their concave upper surface by a gasket or the like, so that the leakage is prevented.

Please amend the paragraph beginning on page 19, line 20, as follows:

In the fuel cell stack thus formed in the second embodiment, the fuel gas flows into the gas channels 2 of the plate 1 and the oxidant gas flows into the gas channels 2'~~(2' is shown in Fig. 2(c))~~ of the other plate 1', so that the electrochemical reaction takes place via the polymer electrolyte membrane of the cell, thereby enabling a DC electric power to be generated.

Please amend the paragraph beginning on page 20, line 21, as follows:

In the second embodiment, the cooling water is also used as a heat medium for preventing the dew condensation of the fuel gas. However, the oxidant gas can be used as the heat medium instead of the cooling water. In this case, the gas inlet header 4'~~(4'is shown in Fig. 2(c))~~ for the oxidant gas is disposed close to the gas inlet header 4 for the fuel gas in the plate 1

on the other surface (the second surface), although the arrangement is not shown, and water channels 7B for supplying the cooling water are disposed in the other plate 1'. Furthermore, in order to prevent the dew condensation of the fuel gas by the oxidant gas (air), the temperature of the air inlet is set such that the dew point of the fuel gas ≤ the temperature of the air.

Please amend the paragraph beginning on page 21, line 12, as follows:

[[Fig. 3]] Each of Fig. 3(a), Fig. 3(b), F g. 3(c) and Fig. 3(d) is a plan view of a fuel cell according to the invention in a third embodiment~~, where the reaction gas and cooling water flowing in corresponding channels arranged in a plate are schematically represented in a perspective view~~. Fig. 3(a) is a plan view of a first plate mounted in a fuel cell stack, viewed from the side of the fuel gas channels and shows the side of a first surface of the first plate. Fig 3(b) is a plan view of the first plate mounted in the fuel cell stack, viewed from the side of the water channels and shows the side of a second surface of the first plate. Fig 3(c) is a plan view of the other plate (a second plate) mounted in the fuel cell stack, viewed from the side of the air channels and shows the side of a third surface of the second plate. Fig. 3(d) is a plan view of the second plate mounted in the fuel cell stack, viewed from the side on which no gas channels are formed and shows the side of a fourth surface of the second plate. In Fig. 3(a) and Fig. 3(b), the structure of a plate (the first plate) 1 is basically similar to that in the second embodiment. Also, in Fig. 3(c) and Fig 3(d), the structure of the other plate (the second plate) 1' is basically similar to that in the second embodiment. As a result, the same reference numeral is attached to the same structural element as in the second embodiment and therefore detailed description thereof is omitted. Hence, detailed description is given exclusively to the structural elements different from those in the second embodiment. A main difference between the second and third

embodiments is that a flow resistance generation section 9 is disposed at the inlet area of the gas channels 2 in [[a]] the plate 1.

Please amend the paragraph beginning on page 22, line 11, as follows:

The flow resistance generation section 9 is designed, as for the size, to fit on the concave portion (not shown) in the inlet of the gas channels 2, and as for the thickness, such that the upper surface of the section 9 is located at the same level as the upper surface of the plate 1, when it is fitted on the concave portion. The flow resistance generation section 9 is mounted onto the concave portion by adhesion. In this case, the mounting is carried out such that the projection pieces 91 are inserted into the corresponding flow channels in the gas channels 2. As a result, the gas inlet header 4 and the gas channels 2 are securely connected to each other via the nozzle holes 92. Fig. 3(a) shows that the gas inlet header 4 and the gas channels 2 are connected to each other via the flow resistance generation section 9. The diameter of the nozzle hole 92 is about 0.25 mm on the side of the inlet (on the side of the gas inlet header 4), and 0.22 mm on the side of the outlet (on the side of the gas channels 2), and each nozzle hole 92 is tapered to some extent such that the gas passing through the hole can be ejected therefrom.

Please amend the paragraph beginning on page 22, line 24, as follows:

~~Aside~~ Referring to Fig. 3(a), Fig. 3(b), Fig.3(c) and Fig. 3(d), aside from the water supply manifold hole 7, a second water supply manifold hole 10 is disposed in both the plate 1 and the other plate 1' so as to pass therethrough. ~~Cooling~~ Referring to Fig. 3(b), cooling water is supplied from the second water supply manifold hole 10, and in the water channels ~~10B (10B is shown in Fig. 3(b))~~ 7B on the other surface (the second surface) of the plate 1, the cooling water

is introduced into an area located somewhat downstream from the flow resistance generation section 9 shown in Fig. 3(a). A difference between the second and the third embodiments also resides in such a structural arrangement.

Please amend the paragraph beginning on page 23, line 4, as follows:

Moreover, in Fig. 3(b), a second water discharge manifold hole 11 is disposed on the upper left side of the plate 1 (on the side opposite to the water supply manifold hole 7) so as to pass therethrough, and it is connected to the water ~~inlet~~ header ~~10A (10A is shown in Fig. 3(b))~~ 7D. In this case, the water ~~inlet~~ supply header ~~10A (10A is shown in Fig. 3(b))~~ 7D is separated from the inlet (the water inlet header 7A) of the water channels ~~10B (10B is shown in Fig. 3(b))~~ 7B for supplying the cooling water by disposing a partition wall ~~(not shown)~~ in the interface to the inlet of the water channels 7B. A difference between the second and the third embodiments also resides in such a structural arrangement.

Please amend the paragraph beginning on page 23, line 12, as follows:

In the third embodiment, as shown in Fig. 3(b), the cooling water is supplied from the second water supply manifold hole 10 to the water channels ~~10B (10B is shown in Fig. 3(b))~~ 7B in the plate 1, and the flows from top to bottom in the water channels ~~10B (10B is shown in Fig. 3(b))~~ 7B. Thereafter, the cooling water is discharged from the outlet of the water channels ~~10B (10B is shown in Fig. 3(b))~~ 7B to the water supply manifold hole 8, and it is further supplied from the water discharge manifold hole 8 to the water supply manifold hole 7 as shown in Fig. 3(b). Moreover, the cooling water is supplied to the water ~~inlet~~ supply header ~~10D (10D is shown in Fig. 3(b))~~ 7D and discharged from the water ~~inlet~~ supply header ~~10D (10D is shown in~~

~~Fig. 3(b))~~ 7D to the second water discharge manifold hole 11, and then flows in the stacking direction of the fuel cell stack, and finally discharged from the end portion of the fuel cell stack to the outside.

Please amend the paragraph beginning on page 23, line 22, as follows:

In the above water circulating channel, the means for supplying the cooling water from the water discharge manifold hole 8 to the water supply manifold hole 7 can be realized, for example, by concave groove-shaped channels (not shown) which are connected to the water discharge manifold hole 8 and to the water supply manifold hole 7 on the other surface of the plate 1, or by a tube-shaped connection channel disposed either in the end plate of the fuel cell stack or outside the fuel cell stack such that the water discharge manifold hole 8 is connected to the water supply manifold hole 7. In this case, the cooling water is supplied in the water channels ~~10B (10B is shown in Fig. 3(b))~~ 7B in the plate 1 and then returned to the water supply header ~~10D (10D is shown in Fig. 3(b))~~ 7D in the plate 1.

Please amend the paragraph beginning on page 24, line 5, as follows:

The reason why the cooling water is supplied from the second water supply manifold hole 10 is due to the fact that the polymer electrolyte membrane in the cell connecting to the gas channel 2 is humidified and maintained in the saturated moist state, in which case, the cooling water cools the inlet area for the water channels ~~10B (10B is shown in Fig. 3(b))~~ 7B, and further cools the inlet area for the gas channels 2 facing the water channels ~~10B (10B is shown in Fig. 3(b))~~ 7B on the other surface, so that the dew point of the fuel gas is lowered when the fuel gas is

introduced into the gas channels 2, and thereby the water vapor contained in the fuel gas is compulsively condensed.

Please amend the paragraph beginning on page 24, line 14, as follows:

Furthermore, the reason why the cooling water passed through the water channels in the plate 1 is again returned to the water supply header ~~10D (10D is shown in Fig. 3(b))~~ 7D is due to the fact that the area surrounded by the broken line in FIG. 3(b) is warmed up, in which case, the flow resistance generation section 9 is disposed in an area facing the above-mentioned area on the other surface, and the flow resistance generation section 9 is warmed up by the heat conduction, so that the dew condensation in the nozzle holes 9 is prevented.